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Fiscal Policy and International Competitiveness: Evidence from Ireland*

VAHAGN GALSTYAN
IIIS, Trinity College Dublin

PHILIP R. LANE
IIIS, Trinity College Dublin and CEPR

Abstract: Our goal in this paper is to investigate the relation between government spending and the long-run behaviour of the Irish real exchange rate. We postulate that an increase in government consumption should be associated with real appreciation, while the impact of government investment is ambiguous. Empirically, we find that an increase in government consumption indeed appreciates the real exchange rate while an increase in government investment is associated with real depreciation. Accordingly, the level and composition of government spending matters for Irish external competitiveness.

I INTRODUCTION

Our goal in this paper is to empirically investigate the link between government spending and the long-run behaviour of the Irish real exchange rate. The determination of the real exchange rate is highly relevant for a small open economy, in view of the central role played by international relative prices in determining the location of production and the level of external competitiveness. Moreover, understanding the behaviour of the real exchange rate is especially important for members of a monetary union, since shifts in real exchange rates (vis-à-vis other member countries) take the form

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Email: v.galstyan@tcd.ie, plane@tcd.ie.

of inflation differentials. Such inflation differentials cannot be properly interpreted without having a model of the long-run behaviour of the real exchange rate. In particular, an above-average inflation rate in a given period may reflect convergence towards a more appreciated long-run equilibrium real exchange rate. Alternatively, an above-average inflation rate may reflect overshooting, with a real exchange rate that is above its long-run equilibrium value and thereby being associated with a projected reversion in the inflation rate in subsequent periods in order to restore the long-run equilibrium.

The connection between domestic fiscal policy and the real exchange rate is especially interesting, since fiscal policy is the primary macroeconomic policy tool that is retained in national control by members of a monetary union. The International Monetary Fund has highlighted the empirical importance of government consumption as an important driver of medium-term real exchange rate movements for a large panel of countries (see Ricci *et al.,* 2008 and Lee *et al.,* 2008).[1] This is in line with earlier work by Froot and Rogoff (1991), De Gregorio *et al.,* (1994) and Chinn (1999) who also found that increases in government consumption are associated with long-run real appreciation. The general mechanism behind this result is that government consumption is more highly concentrated in the nontraded sector than is private consumption – accordingly, an increase in government consumption shifts the composition of total spending towards the nontraded sector and drives up the relative price of nontradables. While the long-run price impact of shifts in the structure of demand should be mitigated by the inter-sectoral reallocation of labour (in the extreme, the Balassa-Samuelson (Balassa, 1964 and Samuelson, 1964) hypothesis postulates that demand factors are irrelevant in the long run), the existence of sector-specific fixed factors allows a role for the composition of demand even over a sustained period that can be taken as the " long run" for practical purposes.

The literature has focused on the connection between government consumption and the real exchange rate. However, it is also relevant to investigate the relation between public investment and the real exchange rate. The distinction is important, since government consumption and government investment may be expected to have different effects on the evolution of relative price levels. While an increase in government consumption is typically modelled as increasing the relative demand for nontradables and thereby leading to real appreciation, a long-run increase in public investment has an ambiguous impact on the real exchange rate since an expansion in the public capital stock may be expected to enhance productivity. While an increase in

[1] Panel studies of long-run real exchange rate behaviour are also provided by Lane and Milesi-Ferretti (2002a; 2004) and Galstyan (2007).

public investment that delivers a productivity gain in the tradables sector may generate real appreciation through the Balassa-Samuelson mechanism, if public investment disproportionately raises productivity in the nontradables sector, it may actually lead to real depreciation. Moreover, if productivity is increased symmetrically in both sectors, there is no long-run impact on the relative price of nontradables and the real exchange rate.

Galstyan and Lane (2009) illustrate these mechanisms by laying out a two-sector small open economy model that incorporates both government consumption and government investment as potential influences on the real exchange rate. In the empirical work in that paper, the links between the different types of government spending and the real exchange rate are estimated for a panel of nineteen advanced economies over 1980-2004.[2] Our approach in this paper is complementary in that we focus on the evidence for a single country (Ireland).[3] We also adapt the model developed in Galstyan and Lane (2009) to allow for exogenous shifts in the terms of trade.

The rest of the paper is organised as follows. Section II describes the theoretical framework while Sections III to V describe the data, estimation methodology and report empirical results. Some conclusions are offered in Section VI.

II THEORETICAL FRAMEWORK

In this section, we briefly describe a modified version of the model developed by Galstyan and Lane (2009), where we extend that model by incorporating an exogenously-determined terms of trade.

The production functions for traded and nontraded goods are respectively

$$Y_T = A_T{*}F(L_T, K_T) = (A_T Z^{\alpha_Z}) L_T^{\alpha_L} K_T^{\alpha_K} \tag{1}$$

$$Y_N = A_N{*}G(L_N, K_N) = (A_N Z^{\beta_Z}) L_n^{\beta_L} K_N^{\beta_K} \tag{2}$$

where L and K stand for labor and capital, while Z stands for the public capital stock. That is, we assume that total factor productivity in each sector is a composite of a sector-specific term ($A_T{*}$, $A_N{*}$) and the level of public capital.

[2] The set of advanced economies are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, United Kingdom, United States.

[3] Lane and Milesi-Ferretti (2002b) also studied the long-run behaviour of the Irish real exchange rate. However, that study did not include government spending variables. In addition, it did not control for relative sectoral productivity levels.

Accordingly, productivity in both sectors is enhanced by a larger stock of public capital but we allow for the impact to be potentially different across sectors (if $\alpha_Z \neq \beta_Z$). We assume that $\alpha_L + \alpha_K = 1$, but $\beta_L + \beta_K < 1$. That is, we incorporate a fixed factor of production (normalised to 1) in the nontraded sector such that the production function exhibits diminishing returns to labor and capital.[4]

Following Lane and Milesi-Ferretti (2004), we assume that the home-produced traded good is not consumed at home, with all of the output destined for export markets. (We can think of the home country producing a specialised intermediate good that is an input into the global production system.) In the other direction, the home country imports a composite world tradable good that is used for domestic consumption and investment. The price of the domestically-produced traded good P_X is exogenously determined on world markets while the world price of the composite import good is normalised to 1. Accordingly, P_X measures the terms of trade (the relative price of exports in terms of imports), while the price of nontraded goods is domestically determined and the relative price of nontraded goods (relative to the export good) is labelled P_N. (We assume that the relative price of nontradables in the rest of the world is exogenously determined and, for simplicity, we assume it is constant and normalised to unity.)

The accumulation functions for the private capital stocks in the traded and nontraded sectors are given by

$$\Delta K_T = I_T^{\ K} - \delta K_T \tag{3}$$

$$\Delta K_N = I_N^{\ K} - \delta K_N \tag{4}$$

while the public capital stock evolves according to

$$\Delta Z = I^Z - \delta Z \tag{5}$$

We assume that private capital formation in the traded and nontraded sectors only requires the imported good as an input, while public capital formation uses only the nontraded good as an input.[5] The representative household has an instantaneous utility function over the goods defined as

[4] Incorporating a fixed factor allows demand-side factors to influence the structure of long-run relative prices. As is well known, demand-side factors are irrelevant for long-run relative prices if both sectors show constant returns to scale in mobile factors (Obstfeld and Rogoff, 1996). The main results do not change if we also allow for a fixed factor in the traded sector.

[5] In fact, the details of the investment process are not important for our analysis. Taking our polar assumptions just simplifies the presentation of the model.

$$C = \frac{C_T^{\,1-\gamma} C_N^{\,\gamma}}{(1-\gamma)^{1-\gamma}\gamma^{\gamma}} \tag{6}$$

with the implication that optimal household expenditure shares on traded and nontraded goods are fixed at $(1-\gamma)$ and γ respectively, with a unit elasticity of the relative consumption of nontradables in relation to the relative price of nontradables.

The welfare-based consumer price index consistent with Equation (6) is

$$P = P_N^{\,\gamma} \tag{7}$$

Since our assumptions mean that the overseas consumer price index is normalised to unity, changes in P correspond to changes in the consumption-based real exchange rate.[6]

The government runs a balanced budget, levying lump-sum taxes equal to the value of total government consumption and government investment

$$T = G_T + P_N(G_N + I^Z) \tag{8}$$

where G_T, G_N are the levels of public consumption of the traded and nontraded goods respectively and I^Z is the level of public investment.

Households own the domestic stocks of capital in the traded and nontraded sectors. There are no inter-sectoral or international capital adjustment costs, so that the return on capital is equal to the exogenously-fixed world interest rate. In addition, households own the fixed factor in the nontraded sector and so receive the income accruing to that factor (the residual claimant on profits in the nontraded sector). Accordingly, households face the following budget constraint

$$\Delta B = rB + P_X Y_T + P_N Y_N - (I_N^{\,K} + I_T^{\,K}) - C_T - P_N C_N - T \tag{9}$$

where B is an international bond that pays the fixed real world interest rate (in terms of the world basket of tradables), P_X is exogenously-determined relative price of the export good and T is the tax burden.

For simplicity, we assume an inelastic aggregate labor supply. Labor is perfectly inter-sectorally mobile, such that the equilibrium in the labor market is

[6] The price of the export good does not directly affect the consumption-based real exchange rate, since it is assumed to be an intermediate good that does not enter the home or foreign consumer price index.

$$L = L_N + L_T \tag{10}$$

The equilibrium in the nontraded goods sector is

$$Y_N = C_N + G_N + I^Z \tag{11}$$

while the trade balance is determined by

$$TB = P_X Y_T - C_T - G_T - (I_N{}^K + I_T{}^K) \tag{12}$$

Equations (1) to (12) together with the first-order conditions for private consumption and private investment and the profits of the non-traded sector form the system.

Our primary interest is in the long-run behavior of the real exchange rate. Accordingly, we focus on the steady-state solution of the model. In order to obtain an analytical solution, we assume no depreciation.[7] We initially solve for a benchmark steady state in which the levels of net foreign assets and government consumption are zero. Then we log-linearise the system around this benchmark, in order to examine the sensitivity of the steady-state real exchange rate to shifts in the steady-state values of the exogenous variables.

In the benchmark steady state the relative price of non-traded goods is[8]

$$P_N = \left(\eta L_N^{\frac{1-\beta_L-\beta_K}{1-\beta_K}} Z^{\frac{\alpha_Z}{1-\alpha_K}-\frac{\beta_Z}{1-\beta_K}}\right)^{1-\beta_K} \tag{13}$$

In the next stage, we log-linearise around this steady state and solve the system. The equation of primary interest is the one governing the consumption-based real exchange rate $\hat{P} = \gamma \hat{P}_N$

$$\hat{P} = \hat{P}_N = -\hat{A}_N + \frac{1-\beta_K}{1-\alpha_K}(\hat{A}_T + \hat{P}_X) + \mu_0(rdB + [dG_N - dG_T]) + \mu_1 \hat{Z} \tag{14}$$

where hatted variables denote percentage deviations from the steady-state values.[9] Equation (14) shows that an improvement in productivity in the nontraded sector generates real depreciation and a decline in the relative price

[7] With depreciation the model has to be solved numerically.

[8] $\eta = \alpha_L \alpha_K{}^{\frac{\alpha_K}{1-\alpha_K}} {}^{\frac{\alpha_K}{1-\alpha_K}-\frac{\beta_K}{1-\beta_K}} \beta_L{}^{-1} \beta_K{}^{\frac{\beta_K}{1-\beta_K}}$. The terms of trade are normalised to unity in the benchmark steady state. See Galstyan and Lane (2009) for further details about the general approach to solving for the steady state.

[9] The equations governing sectorial outputs and consumptions are available upon request.

of nontradables, while an increase in productivity in the traded sector (or an improvement in the terms of trade) generates real appreciation and an increase in the relative price of nontradables, where these forces operate according to the classic Balassa-Samuelson mechanism.[10]

In relation to the fiscal variables, the key coefficients are

$$\mu_0 = \frac{\alpha_L(1-\beta_L-\beta_K)(1-\gamma)}{\alpha_L(1-\gamma)+\beta_L\gamma} > 0 \tag{15}$$

and

$$\mu_1 = \frac{(1-\beta_K)\alpha_Z-(1-\alpha_K)\beta_Z}{\alpha_L} <=> 0 \tag{16}$$

Since $\mu_0 > 0$, the level and composition of spending matters for the real exchange rate. In particular, a country that is a long-run creditor ($dB > 0$) experiences real appreciation, since the interest income on the creditor position enables an increase in the steady-state level of consumption.[11] In the traded sector, this translates into a long-run trade deficit ($dTB = -rdB$), while the increase in demand for the nontraded good generates real appreciation due to the presence of the fixed factor in the nontraded sector.[12] Moreover, an increase in government consumption that is concentrated on nontraded goods ($[dG_N - dG_T] > 0$) also generates real appreciation by shifting the composition of aggregate consumption towards the nontraded good.

Finally, the effect of an increase in the public capital stock on the real exchange rate is given by the coefficient μ_1, which has an ambiguous sign. If an increase in public capital has a symmetric impact on productivity in both sectors ($\alpha_Z = \beta_Z$) and both sectors have similar capital shares ($\alpha_K = \beta_K$), the real exchange rate is unaffected by the level of the public capital stock. If $\alpha_Z = \beta_Z$ but the nontraded sector is less capital intensive ($\alpha_K > \beta_K$), then an increase in public capital generates real appreciation, by the same logic as a symmetric improvement in the sector-specific productivity terms A_T and A_N. However, even if $\alpha_K > \beta_K$, it is possible to construct scenarios in which an increase in the public capital stock generates real depreciation if productivity in the nontraded sector is more sensitive to the level of public capital than is productivity in the traded sector ($\alpha_Z < \beta_Z$). Accordingly, the sign of the relation

[10] A symmetric increase in productivity in both sectors generates real appreciation if the nontraded sector is less capital intensive than the traded sector ($\beta_K > \alpha_K$).
[11] See also Lane and Milesi-Ferretti (2002a; 2004) and Galstyan (2007).
[12] As noted earlier, if the share of the fixed factor in the non-traded sector were equal to zero, then $\mu_0 = 0$, and the demand side is redundant for the real exchange rate.

between public investment and the real exchange rate is ultimately an empirical matter.

III DATA

The sample period covers 1980 to 2005. The data set is constructed from three different sets of sub-data: (i) international variables; (ii) fiscal variables; and (iii) sectoral variables.

International Variables

We take the value of exports of goods and services and imports of goods and services in current dollars from the International Monetary Fund's *International Financial Statistics* and define the trade balance as the difference between exports and imports. The terms of trade series is constructed by taking the ratio of the export price deflator to the import price deflator, both from the *OECD Economic Outlook*. We construct two series for the real exchange rate: the CPI-based real exchange rate (*REERCPI*) and an alternative series based on relative GDP deflators (*REERPGDP*).[13] The CPI, GDP deflator and nominal exchange rate series are taken from the IMF's *World Economic Outlook* dataset.

Since we need to express our explanatory variables in relative terms (the value for Ireland relative to the average value for our trading partners), we calculate weighted averages across the 17 industrial countries that form 80 per cent of trade with Ireland.[14] The exception is in constructing the real exchange rate measures, where we use the trade weights provided by Bayoumi *et al.,* (2005). These weights are calculated using trade data for 164 countries over the 1999-2001 period and allow for 'third country' effects.

Fiscal Variables

We take government final consumption expenditure and government fixed capital formation data from the OECD Economic Outlook database and express these variables as ratios to GDP.

Sectoral Variables

We use the levels of labour productivity in services and manufacturing respectively to proxy for productivity levels in the nontraded and traded

[13] In addition, we also examined the real effective exchange rate index published by the IMF (*REERIFS*), which generated similar results.

[14] The countries are Australia, Austria, Belgium, Denmark, Spain, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Portugal, Sweden, United Kingdom and United States.

sectors and construct sectoral price indices in analagous fashion.[15] The data are from the EU KLEMS dataset (Timmer *et al.,* 2008), which provides detailed information on a range of sectoral variables, including current value added and a value added index. Manufacturing is measured by 'total manufacturing' as reported in KLEMS, while services is measured by the sum of 'wholesale and retail trade', 'hotels and restaurants', 'transport and storage and communication', 'finance, insurance, real estate and business services' and 'community social and personal services'. The sectoral price indices are constructed by taking the ratio of value to volume, where the base year is 2000. The relative price of non-traded goods is constructed by taking the ratio of the services price index to the manufacturing price index. Labour productivity in each sector is constructed by taking the ratio of the value added in constant 2000 terms to the number of employees in the sector. The labour productivity differential is the ratio of services labour productivity to manufacturing labour productivity.

IV ESTIMATION

We are interested in estimating the long-run relation that corresponds to the steady-state Equation (14), whereby persistent shifts in the driving variables are associated with persistent shifts in the real exchange rate. Since the variables are non-stationary, cointegration provides the appropriate estimation framework, if there exists a stationary relationship among the variables. Given that cointegration is established in our data, our estimation approach largely follows Pesaran *et al.,* (2001) in extracting the long-run equation through the estimation of an ARDL specification. Pesaran and Shin (1999) and Panopoulou and Pittis (2004) show that the ARDL estimator is superior to alternative long-run estimators.[16]

Given that cointegration is established, we estimate the following ARDL specification

$$y_t = \alpha + \phi y_{t-1} + \sum_{j=1}^{n} \sum_{i=0}^{1} \varphi_i^j x_{t-1}^j + \varepsilon_i \tag{17}$$

We can back out the long-run equation from the ARDL estimates

$$\bar{y} = \frac{\alpha}{1-\phi} + \sum_{j=1}^{n} \frac{\sum_{i=0}^{1} \varphi_i^j}{1-\phi} \bar{x}^j \tag{18}$$

[15] Ideally we would prefer total factor productivity, but this measure can not be constructed due to data limitations.
[16] The unit root and cointegration tests are routine and the details are available from the authors upon request.

where the long-run coefficients give the impact of a shift in the long-run value of x^j on the long-run value of y^j.

Finally, we also estimate the error correction model

$$\Delta y_t = \gamma + \sum_{j=1}^{n} \theta^j \Delta x_t^j + \psi GAP_{t-1} + u_i \tag{19}$$

where GAP denotes the error correction term $y_{t-1} - \bar{y}_{t-1}$.

The long-run equation that we wish to estimate is

$$\begin{aligned} REER_t = \alpha + \beta_1 * RELGCONS_t + \beta_2 * RELGINV_t + \beta_3 * TB_t \\ + \beta_4 * RELRELPROD_t + \beta_5 * TT_t + \beta_6 * RELYC_t + \varepsilon_t \end{aligned} \tag{20}$$

where $RELGCONS_t$ is the level of government consumption in Ireland relative to the average level for trading partners, $RELGINV_t$ is the relative level of government investment, TB_t is the trade balance, $RELRELPROD_t$ is the relative level of productivity in the nontraded sector versus the traded sector (relative to the same relative term for the average of trading partners), TT_t is the terms of trade and $RELYC_t$ is the relative level of GDP per capita.

In broad terms, this is the empirical counterpart to Equation (14) in the model. In view of the limited number of degrees of freedom, we choose to enter sectoral productivity levels in relative terms ($A_N - A_T$) rather than separately. The real exchange rate, productivity, the terms of trade and output per capita are expressed in log terms, whereas the fiscal variables and the trade balance are scaled relative to GDP. The fiscal variables, relative sectoral productivity and output per capita are each measured as deviations from the corresponding values for the weighted average of Ireland's trading partners, since only the idiosyncratic component matters for the determination of the real exchange rate. The trade balance and the terms of trade are intrinsically measured in relative terms, such that no correction is required for these variables.

The relative level of GDP per capita does not appear as a determinant of the real exchange rate in the theoretical model. Accordingly, we run a benchmark specification in which this variable is excluded. However, we also consider an extended specification which includes relative GDP per capita, since this variable may capture non-modelled factors such as non-homotheticity in preferences (Bergstrand, 1991). An increase in relative GDP per capita may be associated with real appreciation, to the extent that an increase in relative income leads to a shift in the composition of demand towards the nontradables sector. This may be expected if the income elasticity of demand for nontradables (e.g. many types of personal services) is higher than the income elasticity of demand for tradables (mainly manufactured goods).

As indicated earlier, we consider three measures of the real exchange rate: *REERCPI*, *REERIFS* and *REERPGDP*. We include *REERIFS* as an alternative measure of the consumption-based real exchange rate. It differs from *REERCPI* in terms of the method underlying the trade weights and the set of trading partners.

Since the relative price of nontradables is the theoretical mechanism driving the consumption-based real exchange rate, we also directly estimate the long-run relation for the relative price of nontradables

$$RNP_t = \alpha + \chi_1 * GCONS_t + \chi_2 * GINV_t + \chi_3 * TB_t + \chi_4 * RELPROD_t + \chi_5 * TT_t + \chi_6 * YC_t + \varepsilon_t \tag{21}$$

where the main difference in terms of specification is that the fiscal variables, relative productivity and output per capita need not be expressed relative to the average values for trading partners, since the relative price of nontradables is determined just by the domestic values of these variables, in addition to the the trade balance and the terms of trade. As with the real exchange rate, the relative price of nontradables is expressed in logs.

V RESULTS

Table 1 shows the long-run estimates for the real exchange rate.[17] The CPI-based real exchange rate *REERCPI* is the dependent variable in columns (1) and (2), with *REERPGDP* considered in columns (3)-(4). The benchmark specification is reported in columns (1) and (3), while the expanded specification that includes relative GDP per capita as an additional regressor is reported in columns (2) and (4).

Column (1) shows that increases in the relative level of government consumption are associated with appreciation of the CPI-based real exchange rate, while increases in the long-run level of relative government investment are associated with real depreciation, with both effects significant at the 5 per cent level. The estimated magnitude for government consumption is also quite sizeable and is much larger in absolute value than the scale of the government investment effect. Accordingly, the core hypothesis that the level and composition of government spending matters for the real exchange rate receives support in the data for Ireland. The pattern that an increase in the

[17] We begin with the long-run estimates, since the focus of our interest is in the long-run behaviour of the real exchange rate. The estimates of the first-stage equation for the cointegration test (Bounds-Test) and the underlying ARDL Equation (17) are available upon request.

Table 1: *Long-Run Real Exchange Rate*

	REERCPI		*REERGDP*	
	(1)	(2)	(3)	(4)
Rel. Govt. Consumption	1.62	1.97	1.25	1.48
	(0.57)**	(0.61)***	(0.52)**	(0.42)***
Rel. Govt. Investment	–0.14	–0.25	–0.14	–0.19
	(0.06)**	(0.08)***	(0.08)	(0.06)***
Trade Balance	–1.37	–1.43	–1.37	–0.88
	(0.66)*	(0.65)**	(0.71)*	(0.46)*
Rel. Prod. Diff	–0.87	–0.55	–0.96	–0.31
	(0.28)***	(0.33)	(0.28)***	(0.23)
Terms of Trade	0.75	2.22	0.27	2.51
	(0.44)	(1.00)**	(0.46)	(0.78)***
Rel. GDP per Capita		0.77		1.00
		(0.46)		(0.35)**
R^2	0.54	0.62	0.79	0.88
ECM				
GAP(-1)	–0.55	–0.57	–0.52	–0.63
	(0.17)***	(0.18)***	(0.17)***	(0.18)***

***, **, * denote significance at the 1, 5 and 10 per cent levels. Long-run estimates, backed out of the ARDL estimates described in Equation (17). The long-run standard errors are constructed using the delta method.

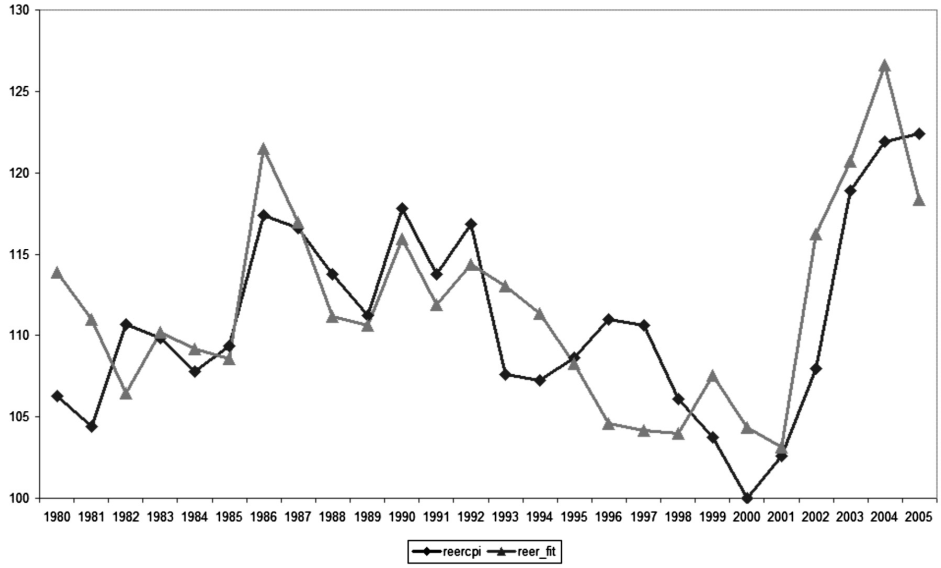
long-run level of government investment is associated with long-run real depreciation is consistent with public capital disproportionately boosting productivity in the nontraded sector.

In relation to the other regressors, the trade balance and relative sectoral productivity enter with the expected signs and are significant. The persistent increase in Ireland's trade surplus over the sample period has been a factor in support of real depreciation, while the faster productivity growth in the traded sector relative to the nontraded sector has operated to generate real appreciation. Finally, the terms of trade enters with the expected positive sign but is marginally insignificant.

We add relative GDP per capita as a regressor in column (2). The absolute magnitudes of the estimated coefficients fiscal variables are larger and both variables are now significant at the 1 per cent level. The terms of trade also turns significant at the 5 per cent level in this specification. Relative sectoral productivity and GDP per capita are individually insignificant but are jointly significant (these are highly collinear variables). We illustrate the overall performance of the estimated equation by fitting the estimated series for the real exchange rate from the specification reported in column (2).

Figure 1 plots the actual and fitted series for the real exchange rate and shows that the actual real exchange rate moves quite closely with the estimated long-run real exchange rate. The results for *REERPGDP* are broadly similar. The main differences are that government investment is marginally insignificant in the benchmark specification and relative GDP per capita is significantly positive in the expanded specification.

Figure 1: *Real Exchange Rate: Actual and Fitted Values*



We turn to the regressions for the relative price of nontradables in Table 2. The results are generally stronger for the relative price of nontradables than for the aggregate real exchange rate. This is to be expected, since the aggregate real exchange rate is more exposed to the noise associated with non-fundamental shifts in nominal exchange rates that may temporarily induce deviations in the law of one price for tradables and obscure the contribution of the relative price of nontradables to overall real exchange rate determination.

While government consumption is marginally insignificant in the benchmark specification in column (1), government investment is significant and, consistent with the results for the real exchange rate, has a negative pattern of co-movement with the relative price of nontradables. In terms of the other variables, a bigger trade surplus is associated with a lower relative price of nontradables, while the Balassa-Samuelson effect is strongly supported with relative sectoral productivity highly significant and an estimated coefficient

Table 2: *Long-Run Relative Price of Nontradables*

	(1)	*(2)*
Govt. Consumption	3.66	7.77
	(2.14)	(0.79)***
Govt. Investment	–4.73	–9.46
	(2.61)*	(1.08)***
Trade Balance	–2.01	–1.49
	(0.81)**	(0.29)***
Prod. Diff	–0.92	–0.27
	(0.17)***	(0.13)*
Terms of Trade	–1.20	1.21
	(0.69)	(0.42)**
GDP per Capita		0.96
		(0.18)***
R^2	0.97	0.99
ECM		
GAP(-1)	–0.43	–0.89
	(0.13)***	(0.13)***

***, **, * denote significance at the 1, 5 and 10 per cent levels. Long-run run estimates, backed out of the ARDL estimates described in Equation (17). The long-run standard errors are constructed using the delta method.

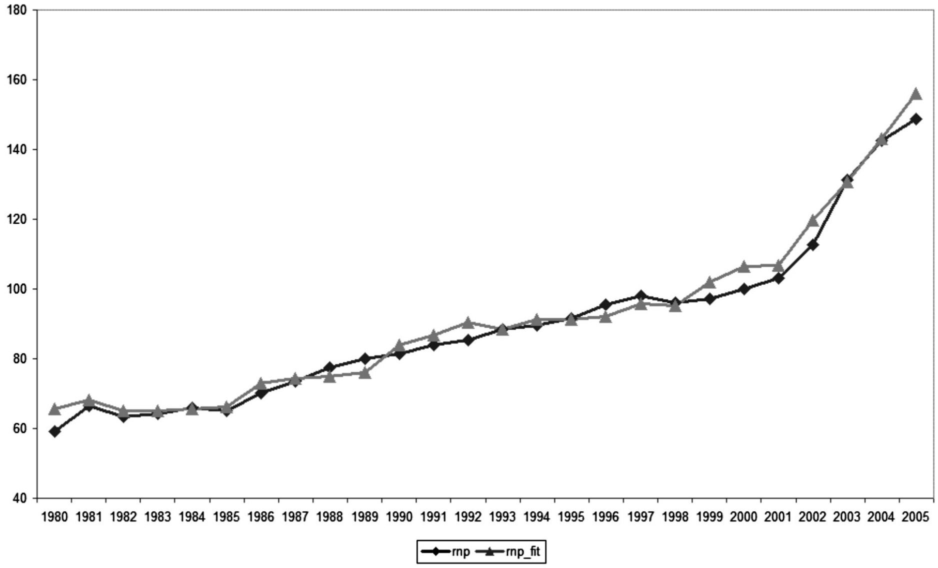
close to unity.[18] The terms of trade enters negatively as expected but is marginally insignificant. All variables are significant in the expanded specification in column (2). Once we control for GDP per capita, both government consumption and government investment are significant at the 1 per cent level. In addition, the terms of trade is now significant, while GDP per capita itself is significant at the 1 per cent level. We show the overall performance of this specification in Figure 2, which shows that the fitted model is able to explain the positive trend in the relative price of nontradables.

Tables 1 and 2 also report the error-correction coefficients from the estimation of Equation (19).[19] Table 1 shows that the short-run dynamics of the real exchange rate are powerfully influenced by the long-run relation. Deviations from the long-run equation corrected quite rapidly, with an estimated half-life of less than a year. Table 2 shows that the rate of convergence is even more rapid for the relative price of nontradables.

[18] From Equation (14), the relative price of nontradables should be proportional to relative sectoral productivity if relative capital shares are the same in both sectors.

[19] As is standard, we confine attention to the error-correction term in the short-run dynamics equation. See also Ricci *et al.,* (2008).

Figure 2: *Relative Price of Nontradables: Actual and Fitted Values*



VI CONCLUSIONS

Our aim in this paper has been to investigate the long-run relation between government spending and the real exchange rate for the Irish economy. Relative to the previous literature, our primary innovation has been to allow government consumption and government investment to have differential effects on the real exchange rate and the relative price of nontradables. The Irish evidence provides emphatic support for the proposition that the composition of government spending matters for external competitiveness. In particular, we find that increases in government consumption are associated with long-run real appreciation and an increase in the relative price of nontradables. In contrast, an increase in the long-run level of public investment is associated with real depreciation and a decline in the relative price of nontradables.

For a member country of a monetary union, these results concerning the long-run behaviour of the real exchange rate translate into projections about inflation differentials among the member states. Accordingly, our estimation approach may be helpful in understanding the sources of divergent inflation behaviour under EMU.

Finally, there is scope for additional future research in this area. In relation to the results concerning government consumption, it may be interesting to examine whether there are differences between expanding government employment versus raising the pay level for public sector workers. Differences between these subcomponents have been identified at the cyclical frequency by Wynne (1996), Finn (1998), Lane and Perotti (2003) and Benetrix and Lane (2009). However, a similar analysis has not been done in relation to the long-run behaviour of the real exchange rate.

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